

WHAT IS CLAIMED IS:

1. A driving circuit for a vacuum fluorescent display
for pulse-driving a filament of the vacuum fluorescent
5 display with a pulse voltage, comprising:
a detecting unit for detecting that the level of
the pulse voltage is fixed, the detecting unit outputting
a detection signal indicative of the result of the
detection.
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2. The driving circuit for a vacuum fluorescent display
according to claim 1, wherein based on the detection signal,
the driving circuit for a vacuum fluorescent display
outputs to exterior a signal for notifying of an abnormal
15 state of the pulse voltage.
3. The driving circuit for a vacuum fluorescent display
according to claim 1, wherein the detecting unit is a
pulse detecting unit for detecting that the level of the
20 pulse voltage is fixed, based on the number of pulses
per predetermined time period TP of the pulse voltage.
4. The driving circuit for a vacuum fluorescent display
according to claim 3, wherein the pulse detecting unit:
25 counts the number of pulses per predetermined time
period TP of the pulse voltage; and
outputs the detection signal indicating that the

level of the pulse voltage is fixed when the counted number of pulses per predetermined time period TP equals to or is less than the number of a reference pulse number.

- 5 5. The driving circuit for a vacuum fluorescent display according to claim 1, wherein the detecting unit is a level detecting unit for detecting that the level of the pulse voltage is fixed, based on the level of a DC-rectified voltage produced by integrating the pulse voltage.
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6. The driving circuit for a vacuum fluorescent display according to claim 5, wherein the level detecting unit:
- measures a time period for which the level of the DC-rectified voltage produced by integrating the pulse
- 15 voltage shifts to the level indicating that the level of the pulse voltage is fixed; and
- outputs the detection signal indicating that the level of the pulse voltage is fixed when the measured time period is equal to or longer than a predetermined
- 20 time period TL.
7. The driving circuit for a vacuum fluorescent display according to claim 1, wherein the detecting unit comprises:
- 25 a pulse detecting unit for detecting that the level of the pulse voltage is fixed, based on the number of the pulses per predetermined time period TP of the pulse

voltage; and

a level detecting unit for detecting that the level of the pulse voltage is fixed, based on the level of the DC-rectified voltage produced by integrating the pulse voltage, and wherein

the detecting unit is switchable to either the operation of the pulse detecting unit or the operation of the level detecting unit.

8. The driving circuit for a vacuum fluorescent display according to claim 7, wherein the driving circuit for a vacuum fluorescent display comprises a switching unit that:

receives from an exterior data for switching to either the operation of the pulse detecting unit or the operation of the level detecting unit; and that

switches to either the operation of the pulse detecting unit or the operation of the level detecting unit, based on the data received from the exterior.

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9. The driving circuit for a vacuum fluorescent display according to claim 1, wherein the driving circuit for a vacuum fluorescent display is a semiconductor integrated circuit for outputting a pulse-driving signal for pulse-driving the filament, with a switching element externally connectable for generating the pulse voltage based on the pulse-driving signal.

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10. The driving circuit for a vacuum fluorescent display according to claim 1, wherein the driving circuit for a vacuum fluorescent display outputs a pulse-driving signal for pulse-driving the filament, and comprises a
5 switching element for generating the pulse voltage based on the pulse-driving signal.

11. The driving circuit for a vacuum fluorescent display according to claim 10, wherein the driving circuit for
10 a vacuum fluorescent display is a semiconductor integrated circuit with the switching element connected externally.

12. The driving circuit for a vacuum fluorescent display
15 according to claim 10, wherein the driving circuit for a vacuum fluorescent display is a semiconductor integrated circuit integrated with the switching elements.

20 13. The driving circuit for a vacuum fluorescent display according to claim 7, wherein the driving circuit for a vacuum fluorescent display comprises an integrating circuit for producing a DC-rectified voltage by integrating the pulse voltage.

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14. The driving circuit for a vacuum fluorescent display according to claim 13, wherein the driving circuit for

a vacuum fluorescent display is a semiconductor integrated circuit with the integration circuit connectable externally.

- 5 15. The driving circuit for a vacuum fluorescent display according to claim 1, wherein the driving circuit for a vacuum fluorescent display comprises a grid driving unit for driving a grid electrode of the vacuum fluorescent display and a segment driving unit for driving a segment
10 electrode of the vacuum fluorescent display, and wherein the driving circuit further comprises a control unit for controlling at least one output of the outputs of the filament driving unit, the grid driving unit and the segment driving unit in order to terminate the driving
15 of at least one of the filament, the grid electrode and the segment electrode, based on the detection signal.
16. The driving circuit for a vacuum fluorescent display according to claim 15, wherein the driving circuit for
20 a vacuum fluorescent display controls at least one output of the outputs of the filament driving unit, the grid driving unit and the segment driving unit such that at least one of levels of the pulse voltage, the voltage for driving the grid electrode or the voltage for driving
25 the segment electrode is at the other level for terminating the driving, based on the detection signal.
17. The driving circuit for a vacuum fluorescent display

according to claim 15, wherein the control unit puts at least one output of the outputs of the filament unit, the grid driving unit or the segment driving unit in a high-impedance status, based on the detection signal.

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18. The driving circuit for a vacuum fluorescent display according to claim 15, wherein the driving circuit for a vacuum fluorescent display outputs to exterior a signal for notifying that the level of the pulse voltage is fixed,
10 based on the detection signal.

19. The driving circuit for a vacuum fluorescent display according to claim 15, wherein the driving circuit for a vacuum fluorescent display is a semiconductor
15 integrated circuit, with a switching element being connectable externally which generates the pulse voltage based on the output of the filament control unit.

20. The driving circuit for a vacuum fluorescent display
20 according to claim 15, wherein the driving circuit for a vacuum fluorescent display comprises a switching element for generating the filament pulse voltage based on the output of the filament driving unit.